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(54) Title: SHALE HYDRATION INHIBITION AGENT AND METHOD OF USE

(57) **Abstract:** A water-base drilling fluid for use in drilling wells through a formation containing a shale which swells in the presence of water. The drilling fluid preferably includes: an aqueous based continuous phase, a weight material, and a shale hydration inhibition agent having the formula:  $H_2N - R - \{OR'\}_x - Y$ , in which R and R' are alkylene groups having 1 to 6 carbon atoms and x is a value from about 1 to about 25. The Y group should be an amine or alkoxy group, preferably a primary amine or a methoxy group. The shale hydration inhibition agent should be present in sufficient concentration to reduce the swelling of the shale. Also inclusive of the present invention is a method of reducing the swelling of shale clay encountered during the drilling of a subterranean well, the method comprising circulating in the well a water-base fluid formulated in accordance with the present invention.

# INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 C09K7/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	WO 01 59028 B1 (M-I L.L.C.) 16 August 2001 (2001-08-16) page 4, line 19 -page 6, line 8 claims 1-19 ---	1-8, 10-16
A		9,17,18
Y	EP 0 838 514 A (MI DRILLING FLUIDS LLC) 29 April 1998 (1998-04-29)  page 5, line 11 - line 22 page 6, line 55 -page 8, line 19 page 9, line 10 - line 58 ---	1,4-6, 8-11,13, 14,16,17
Y	EP 0 634 468 A (MI DRILLING FLUIDS CO) 18 January 1995 (1995-01-18)  page 5, line 37 -page 8, line 17 page 9, line 5 - line 42 ---	1,4-6, 8-11,13, 14,16,17
		-/-

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Patent family members are listed in annex.

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Date of the actual completion of the International search	Date of mailing of the International search report
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Boulon, A

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/47311

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 93 02151 A (LUBRIZOL CORP) 4 February 1993 (1993-02-04) page 9, line 9 - line 34 page 27, line 1 -page 28, line 11	1,2, 8-10,13
Y	US 5 330 662 A (JAHNKE RICHARD W ET AL) 19 July 1994 (1994-07-19) column 9, line 21 - line 46 column 19, line 31 -column 22, line 7	1,2, 8-10,13

**INTERNATIONAL SEARCH REPORT**

Ir on on patent family members

International Application No  
PCT/US 01/47311

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 0159028	B1	16-08-2001	US AU WO	6247543 B1 3311301 A 0159028 A2	19-06-2001 20-08-2001 16-08-2001
EP 0838514	A	29-04-1998	US EP AT AU AU CA DE DE EP NO US	5424284 A 0838514 A1 173290 T 675709 B2 6612194 A 2126938 A1 69414481 D1 69414481 T2 0634468 A1 942493 A 5908814 A	13-06-1995 29-04-1998 15-11-1998 13-02-1997 12-01-1995 03-01-1995 17-12-1998 01-07-1999 18-01-1995 03-01-1995 01-06-1999
EP 0634468	A	18-01-1995	US AT AU AU CA DE DE EP EP NO US	5424284 A 173290 T 675709 B2 6612194 A 2126938 A1 69414481 D1 69414481 T2 0634468 A1 0838514 A1 942493 A 5908814 A	13-06-1995 15-11-1998 13-02-1997 12-01-1995 03-01-1995 17-12-1998 01-07-1999 18-01-1995 29-04-1998 03-01-1995 01-06-1999
WO 9302151	A	04-02-1993	AU AU BR CA CN EP MX NO PH US WO ZA	647309 B2 2324492 A 9205352 A 2088480 A1 1068842 A 0549770 A1 9204198 A1 930976 A 30262 A 5260268 A 9302151 A1 9205310 A	17-03-1994 23-02-1993 16-11-1993 19-01-1993 10-02-1993 07-07-1993 01-07-1993 17-03-1993 20-02-1997 09-11-1993 04-02-1993 28-04-1993
US 5330662	A	19-07-1994	CA CN EP FI NO US ZA	2091420 A1 1076471 A 0561607 A2 931163 A 930950 A 5620946 A 9301864 A	18-09-1993 22-09-1993 22-09-1993 18-09-1993 20-09-1993 15-04-1997 05-10-1993